CLAIMS

We Claim:

1. A method, comprising:

depositing a first sacrificial layer on a substrate;

forming an array of mirror plates on the first sacrificial layer, wherein a gap between the adjacent mirror plates of the mirror plate array is from 0.15 to 0.5 micrometers;

depositing a second sacrificial layer on the mirror plates with a thickness from 0.5 to 1.5 micrometers;

forming a hinge support on the second sacrificial layer for each mirror plate for supporting the mirror plate; and

removing at least a portion of one or both of the first and the second sacrificial layers using a spontaneous vapor phase chemical etchant.

2. The method of claim 1, wherein step of forming the array of mirror plates on the first sacrificial layer further comprises: forming the array of mirror plates on the first sacrificial layer such that a center-to-center distance between adjacent mirror plates is from 4.38 to 10.16 micrometers.

3. The method of claim 1, wherein the array of mirror plates comprises at least 1280 mirror plates along a length of the array.

4. The method of claim 1, wherein the array of mirror plates comprises at least 1400 mirror plates along a length of the array.

5. The method of claim 1, wherein the array of mirror plates comprises at least 1600 mirror plates along a length of the array.

6. The method of claim 1, wherein the array of mirror plates comprises at least 1920 mirror plates along a length of the array.

7. The method of claim 1, wherein the step of removing the first and second sacrificial layers using the spontaneous vapor phase chemical etchant further comprises:

removing the first sacrificial layer using the spontaneous vapor phase chemical etchant via the gap between adjacent mirror plates.

8. The method of claim 1, wherein the gap is from 0.15 to 0.25 micrometers.

9. The method of claim 1, wherein the gap is from 0.25 to 0.5 micrometers.

10. The method of claim 1, wherein the gap is 0.5 micrometers or less.

11. The method of claim 1, wherein the thickness of the second sacrificial layer is from 0.5 to 1.5 micrometers.

12. The method of claim 1, wherein the thickness of the second sacrificial layer is from 0.8 to 1.25 micrometers.

13. The method of claim 1, wherein the thickness of the second sacrificial layer is from 0.95 to 1.15 micrometers.

14. The method of claim 1, wherein the center-to-center distance between adjacent mirror plates is from 8.07 to 10.16 micrometers.

15. The method of claim 1, wherein the center-to-center distance between adjacent mirror plates is from 6.23 to 9.34 micrometers.

16. The method of claim 1, wherein the center-to-center distance between adjacent mirror plates is from 4.38 to 6.57 micrometers.

17. The method of claim 1, wherein the center-to-center distance between adjacent mirror plates is from 4.38 to 9.34 micrometers.

18. The method of claim 1, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, a) the mirror plate can rotate relative to the substrate along a rotation axis that is parallel to but offset from a diagonal of the mirror plate when viewed from the top of the mirror plate; and b) the mirror plate can rotate to an angle at least 14 degrees relative to the substrate; and

wherein the step of forming the array of mirror plates on the first sacrificial layer further comprises:

forming the array of mirror plates on the first sacrificial layer such that adjacent mirror plates have a gap from 0.15 to 0.5 micrometers therebetween.

19. The method of claim 1, wherein the step of forming a hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate above the substrate to a rotation angle at least 14 degrees relative to the substrate.

20. The method of claim 1, further comprising:

forming an electrode for each mirror plate; and

disposing the electrode proximate to the mirror plate for electrostatically deflecting the mirror plate.

21. The method of claim 1, wherein the substrate is glass or quartz that is visible light transmissive.

22. The method of claim 20, further comprising:

depositing an anti-reflection film on a surface of the substrate.

23. The method of claim 20, further comprising:

depositing a light absorbing frame around an edge of the substrate.

24. The method of claim 1, wherein the step of removing the first and second sacrificial layer further comprises:

monitoring an endpoint of the sacrificial layer being removed using a residual gas analyzer.

25. The method of claim 1, wherein the first sacrificial layer or the second sacrificial layer comprises amorphous silicon.

26. The method of claim 1, wherein the spontaneous vapor phase etchant is an interhalogen.

27. The method of claim 1, wherein the spontaneous vapor phase etchant is HF.

28. The method of claim 1, wherein the spontaneous vapor phase etchant is a noble gas halide.

29. The method of claim 28, wherein the noble gas halide comprises xenon difluoride.

30. The method of claim 26, wherein the interhalogen comprises bromine trichloride or bromine trifluoride.

31. The method of claim 1, wherein a diluent is mixed with the vapor phase etchant during removing the first and second sacrificial layer.

32. The method of claim 31, wherein the diluent is selected from N_2, He, Ar, Kr and Xe.

33. The method of claim 31, wherein the diluent is selected from N_2 and He.

34. The method of claim 1, wherein each mirror plate has an area; and wherein a ratio of a summation of the areas of all mirror plates of the mirror plate array to an area of the substrate is 90 percent or more.

35. The method of claim 1, wherein each mirror plate rotates relative to the substrate in response to an electrostatic force.

36. The method of claim 1, further comprising:

disposing a first electrode proximate to each mirror plate for electrostatically driving the mirror plate to rotate in a first direction relative to the substrate; and

disposing a second electrode proximate to the mirror plate for electrostatically driving the mirror plate to rotate in a second direction opposite to the first direction relative to the substrate.

37. The method of claim 36, wherein the first electrode and the second electrode are disposed on the same side relative to a rotation axis of the mirror plate.

38. The method of claim 36, wherein the first electrode and the second electrode are disposed on the opposite sides relative to a rotation axis of the mirror plate.

39. The method of claim 1, wherein the substrate is semiconductor.

40. The method of claim 1, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first direction to an angle from 15° degrees to 27° degrees relative to the substrate.

41. The method of claim 40, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second direction opposite to the first direction to an angle from 2° degrees to 9° degrees relative to the substrate.

42. The method of claim 1, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first direction to an angle from 17.5° degrees to 22.5° degrees relative to the substrate.

43. The method of claim 42, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second direction opposite to the first direction to an angle from 2° degrees to 9° degrees relative to the substrate.

44. The method of claim 1, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first direction to an angle around 20° degrees relative to the substrate.

45. The method of claim 44, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second direction opposite to the first direction to an angle from 2° degrees to 9° degrees relative to the substrate.

46. The method of claim 1, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first direction to an angle around 30° degrees relative to the substrate.

47. The method of claim 46, wherein the step of forming the hinge support on the second sacrificial layer for each mirror plate further comprises:

forming a hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second direction opposite to the first direction to an angle from 2° degrees to 9° degrees relative to the substrate.

48. The method of claim 11, further comprising:

forming the hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first rotation direction to an angle from 12° degrees to 20° degrees relative to the substrate.

49. The method of claim 48, further comprising:

forming the hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second rotation direction opposite to the first rotation direction to an angle from 2° degrees to 9° degrees relative to the substrate.

50. The method of claim 2, further comprising:

forming the hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a first rotation direction to an angle from 12° degrees to 20° degrees relative to the substrate.

51. The method of claim 50, further comprising:

forming the hinge for the mirror plate such that, after removing the first and second sacrificial layer, the mirror plate can rotate in a second rotation direction opposite to the first rotation direction to an angle from 2° degrees to 9° degrees relative to the substrate.

52. A spatial light modulator, comprising:

an array of mirror devices formed on a substrate for selectively reflecting light incident on the mirror devices, wherein each mirror device comprises:

a mirror plate for reflecting light;

a hinge attached to the mirror plate such that the mirror plate can rotate relative to the substrate, wherein the hinge and the mirror plate are spaced apart from 0.5 to 1.5 micrometers; and

a hinge support on the substrate for holding the hinge on the substrate; and

wherein the adjacent mirror plates have a gap from 0.15 to 0.5 micrometers.

53. The spatial light modulator of claim 52, wherein the array of mirror devices comprises at least 1280 mirror devices along a length of the array.

54. The spatial light modulator of claim 52, wherein the array of mirror devices comprises at least 1400 mirror devices along a length of the array.

55. The spatial light modulator of claim 52, wherein the array of mirror devices comprises at least 1600 mirror devices along a length of the array.

56. The spatial light modulator of claim 52, wherein the array of mirror devices comprises at least 1920 mirror devices along a length of the array.

57. The spatial light modulator of claim 52, wherein the center-to-center distance of adjacent mirror plates is from 8.07 to 10.16 micrometers.

58. The spatial light modulator of claim 52, wherein the center-to-center distance of adjacent mirror plates is from 6.23 to 9.34 micrometers.

59. The spatial light modulator of claim 52, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 6.57 micrometers.

60. The spatial light modulator of claim 52, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 9.34 micrometers.

61. The spatial light modulator of claim 52, wherein the mirror plate is attached to the hinge such that the mirror plate can rotate relative to the substrate along a rotation axis that is parallel to but offset from a diagonal of the mirror plate when viewed from the top of the mirror plate; and wherein the mirror plate can rotate to an angle at least 14 degrees relative to the substrate; and wherein the adjacent mirror plates have a gap from 0.15 to 0.5 micrometers therebetween when the mirror plates are parallel to the substrate.

62. The spatial light modulator of claim 52, further comprising:

an electrode proximate to each mirror plate for electrostatically deflecting the mirror plate.

63. The spatial light modulator of claim 52, wherein the substrate is glass or quartz that is visible light transmissive.

64. The spatial light modulator of claim 63, wherein the substrate has an anti-reflection film on a surface of the substrate.

65. The spatial light modulator of claim 63, wherein the substrate comprises a light absorbing frame around an edge of the substrate.

66. The spatial light modulator of claim 52, wherein a ratio of a summation of all areas of all mirror plates to an area of the substrate is 90 percent or more.

67. The spatial light modulator of claim 52, wherein the mirror plate of each mirror device rotates relative the substrate in response to an electrostatic field.

68. The spatial light modulator of claim 52, wherein each mirror device further comprises:

a first electrode and circuitry that drives the mirror plate of said mirror device in a first rotational direction; and

a second electrode that drives said mirror plate in a second rotational direction opposite to the first rotational direction.

69. The spatial light modulator of claim 68, wherein the first electrode and the second electrode are on the same side relative to the rotation axis of the mirror plate.

70. The spatial light modulator of claim 68, wherein the first electrode and second electrode are on opposite sides relative to the rotation axis of the mirror plate.

71. The spatial light modulator of claim 52, wherein the substrate is semiconductor.

72. The spatial light modulator of claim 52, wherein the gap between the adjacent mirror plates is from 0.15 to 0.25 micrometers when the adjacent mirror plates are parallel to the substrate.

73. The spatial light modulator of claim 52, wherein the gaps between the adjacent mirror plates is 0.25 to 0.5 micrometers when the adjacent mirror plates are parallel to the substrate.

74. The spatial light modulator of claim 52, wherein the mirror plate and the hinge is spaced apart from 0.5 to 1.5 micrometers.

75. The spatial light modulator of claim 52, wherein the mirror plate and the hinge is spaced apart from 0.8 to 1.25 micrometers.

76. The spatial light modulator of claim 52, wherein the mirror plate and the hinge is spaced apart from 0.95 to 1.15 micrometers.

77. The spatial light modulator of claim 52, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle from 12° degrees to 20° degrees relative to the substrate.

78. The spatial light modulator of claim 77, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

79. The spatial light modulator of claim 52, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle from 17.5° degrees to 22.5° degrees relative to the substrate.

80. The spatial light modulator of claim 79, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

81. The spatial light modulator of claim 52, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle around 20° degrees relative to the substrate.

82. The spatial light modulator of claim 81, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

83. The spatial light modulator of claim 52, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle around 30° degrees relative to the substrate.

84. The spatial light modulator of claim 77, wherein the center-to-center distance between adjacent mirror plates of the micromirror array is from 4.38 to 10.16 micrometers.

85. A spatial light modulator, comprising: an array of movable mirror plates formed on a substrate for selectively reflecting a light beam incident on the mirror plates, wherein adjacent mirror plates have a gap from 0.15 to 0.5 micrometers when the adjacent mirror plates are parallel to the substrate.

86. The spatial light modulator of claim 85, further comprising:

a hinge that is attached to each mirror plate such that the mirror plate can rotate relative to the substrate, wherein the hinge and the mirror plate are spaced apart from 0.5 to 1.5 micrometers.

87. The spatial light modulator of claim 85, wherein the adjacent mirror plates have a center-to-center distance from 4.28 to 10.16 micrometers.

88. The spatial light modulator of claim 85, wherein the array of mirror plates comprises at least 1280 mirror plates along a length of the mirror plate array.

89. The spatial light modulator of claim 85, wherein the array of mirror plates comprises at least 1400 mirror plates along a length of the mirror plate array.

90. The spatial light modulator of claim 85, wherein the array of mirror plates comprises at least 1600 mirror plates along a length of the mirror plate array.

91. The spatial light modulator of claim 85, wherein the array of mirror plates comprises at least 1920 mirror plates along a length of the mirror plate array.

92. The spatial light modulator of claim 85, wherein the adjacent mirror plates has a gap of 0.5 micrometers or less therebetween when the adjacent mirror plates are parallel to the substrate.

93. The spatial light modulator of claim 86, wherein a distance between the hinge and the mirror plate is from 0.5 to 0.8 micrometers.

94. The spatial light modulator of claim 86, wherein a distance between the hinge and the mirror plate is from 0.8 to 1.25 micrometers.

95. The spatial light modulator of claim 86, wherein a distance between the hinge and the mirror plate is from 1.25 to 1.5 micrometers.

96. The spatial light modulator of claim 87, wherein the center-to-center distance of adjacent mirror plates is from 6.23 to 9.34 micrometers.

97. The spatial light modulator of claim 87, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 6.57 micrometers.

98. The spatial light modulator of claim 87, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 9.34 micrometers.

99. The spatial light modulator of claim 85, further comprising: a hinge attached to the mirror plate such that the mirror plate can rotate relative to the substrate along a rotation axis that is parallel to but offset from a diagonal of the mirror plate when viewed from the top of the mirror plate; wherein the mirror plate can rotate to an angle at least 14 degrees relative to the substrate; and wherein the adjacent mirror plates has a center-to-center distance from 4.38 to 10.16 micrometers; and wherein the hinge and the mirror plate is spaced apart from 0.5 to 1.5 micrometers.

100. The spatial light modulator of claim 85, further comprising:

an electrode proximate to each mirror plate for electrostatically deflecting the mirror plate.

101. The spatial light modulator of claim 85, wherein the substrate is glass or quartz that is visible light transmissive.

102. The spatial light modulator of claim 101, wherein the substrate comprises an anti-reflection film on a surface of the substrate.

103. The spatial light modulator of claim 101, wherein the substrate comprises a light absorption frame around an edge of the substrate.

104. The spatial light modulator of claim 85, wherein each mirror plate has an area; and wherein a ratio of a summation of all areas of the mirror plates to an area of the substrate is 90 percent or more.

105. The spatial light modulator of claim 85, wherein each mirror plate rotate relative to the substrate in response to an electrostatic field.

106. The spatial light modulator of claim 85, further comprising:

a first electrode that drives the mirror plate rotate in a first rotation direction relative to the substrate; and

a second electrode that drives the mirror plate rotate in a second rotation direction opposite to the first rotation direction relative to the substrate.

107. The spatial light modulator of claim 106, wherein the first electrode and the second electrode are on the same side relative to the rotation axis of the mirror plate.

108. The spatial light modulator of claim 106, wherein the first electrode and the second electrode are on the opposite sides relative to the rotation axis of the mirror plate.

109. The spatial light modulator of claim 85, wherein the substrate is semiconductor.

110. The spatial light modulator of claim 85, wherein the gap between the adjacent mirror plates is from 0.15 to 0.25 micrometers.

111. The spatial light modulator of claim 85, wherein the gap between the adjacent mirror plates is from 0.25 to 0.5 micrometers.

112. The spatial light modulator of claim 85, wherein the gap between the adjacent mirror plates is 0.5 micrometers or less.

113. The spatial light modulator of claim 85, wherein the distance between the hinge and the mirror plate is from 0.15 to 0.25 micrometers.

114. The spatial light modulator of claim 85, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle from 15° degrees to 27° degrees relative to the substrate.

115. The spatial light modulator of claim 114, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

116. The spatial light modulator of claim 85, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle from 17.5° degrees to 22.5° degrees relative to the substrate.

117. The spatial light modulator of claim 116, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

118. The spatial light modulator of claim 85, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle around 20° degrees relative to the substrate.

119. The spatial light modulator of claim 118, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

120. The spatial light modulator of claim 85, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle around 30° degrees relative to the substrate.

121. The spatial light modulator of claim 120, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

122. The spatial light modulator of claim 87, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first rotation direction to an angle from 12° degrees to 20° degrees relative to the substrate.

123. The spatial light modulator of claim 122, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

124. The spatial light modulator of claim 86, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first rotation direction to an angle from 12° degrees to 20° degrees relative to the substrate.

125. The spatial light modulator of claim 124, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

126. The spatial light modulator of claim 87, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first rotation direction to an angle from 12° degrees to 20° degrees relative to the substrate; and wherein the hinge and the mirror plate is spaced apart from 0.5 to 1.5 micrometers.

127. The spatial light modulator of claim 126, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

128. A projection system, comprising:

a light source;

a spatial light modulator that further comprises:

an array of mirror devices formed on a substrate for selectively reflecting light incident on the mirror devices, wherein each mirror device comprises:

a mirror plate for reflecting light;

a hinge attached to the mirror plate such that the mirror plate can rotate relative to the substrate, wherein the hinge and the mirror plate are spaced apart from 0.5 to 1.5 micrometers;

a hinge support on the substrate for holding the hinge on the substrate; and

wherein adjacent mirror plates has a gap from 0.15 to 0.5 micrometers; and

a condensing lens for directing light from the light source onto the spatial light modulator; and

a projecting lens for collecting and directing light reflected from the spatial light modulator onto a display target.

129. The system of claim 128, wherein the array of mirror devices comprises at least 1280 mirror devices along a length of the array.

130. The system of claim 128, wherein the array of mirror devices comprises at least 1400 mirror devices along a length of the array.

131. The system of claim 128, wherein the array of mirror devices comprises at least 1600 mirror devices along a length of the array.

132. The system of claim 128, wherein the array of mirror devices comprises at least 1920 mirror devices along a length of the array.

133. The system of claim 128, wherein adjacent mirror plates have a center-to-center distance from 4.3 to 10.16 micrometers therebetween when the mirror plates are parallel to the substrate.

134. The system of claim 128, wherein the gap between adjacent mirror plates is from 0.25 to 0.5 micrometers therebetween when the mirror plates are parallel to the substrate.

135. The system of claim 128, wherein the gap between adjacent mirror plates is 0.5 micrometers or less therebetween when the mirror plates are parallel to the substrate.

136. The system of claim 128, wherein the center-to-center distance of adjacent mirror plates is from 8.07 to 10.16 micrometers.

137. The system of claim 128, wherein the center-to-center distance of adjacent mirror plates is from 6.23 to 9.34 micrometers.

138. The system of claim 128, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 6.57 micrometers.

139. The system of claim 128, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 9.34 micrometers.

140. The system of claim 128, wherein the mirror plate is attached to the hinge such that the mirror plate can rotate relative to the substrate along a rotation axis that is parallel to but offset from a diagonal of the mirror plate when viewed from the top of the mirror plate; and wherein the mirror plate can rotate to an angle at least 14 degrees relative to the substrate; and wherein the adjacent mirror plates have a center-to-center distance from 4.38 to 10.16 micrometers therebetween when the mirror plates are parallel to the substrate.

141. The system of claim 128, further comprising:

an electrode proximate to each mirror plate for electrostatically deflecting the mirror plate.

142. The system of claim 128, wherein the substrate is glass or quartz that is visible light transmissive.

143. The system of claim 142, wherein the substrate has an anti-reflection film on a surface of the substrate.

144. The system of claim 142, wherein the substrate comprises a light absorbing frame around an edge of the substrate.

145. The system of claim 128, wherein a ratio of a summation of all areas of all mirror plates to an area of the substrate is 90 percent or more.

146. The system of claim 128, wherein the mirror plate of each mirror device rotates relative the substrate in response to an electrostatic field.

147. The system of claim 128, wherein each mirror device further comprises:

a first electrode and circuitry that drives the mirror plate of said mirror device in a first rotational direction; and

a second electrode and circuitry that drives said mirror plate in a second rotational direction opposite to the first rotational direction.

148. The system of claim 147, wherein the first electrode and the second electrode are on the same side relative to the rotation axis of the mirror plate.

149. The system of claim 147, wherein the first electrode and second electrode are on opposite sides relative to the rotation axis of the mirror plate.

150. The system of claim 128, wherein the substrate is semiconductor.

151. The system of claim 128, wherein the light source is an arc lamp having an effective arc length around 1.0 millimeter.

152. The system of claim 128, wherein the light source is an arc lamp having an effective arc length less than 1.0 millimeter.

153. The system of claim 128, wherein the light source is an arc lamp having an effective arc length around 0.7 millimeter.

154. The system of claim 128, further comprising:

a video signal input that inputs a plurality of video signals, based on which the mirror plates of the spatial light modulator selectively reflects light such that the reflected light from the mirror plates forms a plurality of videos on the display target.

155. The system of claim 128, wherein the gap between the adjacent mirror plates is from 0.15 to 0.25 micrometers.

156. The system of claim 128, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle from 15° degrees to 27° degrees relative to the substrate.

157. The system of claim 156, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

158. The system of claim 128, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle from 17.5° degrees to 22.5° degrees relative to the substrate.

159. The system of claim 158, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

160. The system of claim 128, wherein the mirror plate is attached to a hinge such that the mirror plate rotates in a first direction to an angle around 20° degrees relative to the substrate.

161. The system of claim 160, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

162. The system of claim 128, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a first direction to an angle around 30° degrees relative to the substrate.

163. The system of claim 162, wherein the mirror plate is attached to the hinge such that the mirror plate rotates in a second direction to an angle from 2° degrees to 9° degrees relative to the substrate.

164. A projector comprising:

a light source; and

a spatial light modulator that further comprises:

an array of movable mirror plates formed on a substrate for selectively reflecting a light beam incident on the mirror plates, wherein adjacent mirror plates have a gap from 0.15 to 0.5 micrometers when the mirror plates are parallel to the substrate.

165. The projector of claim 164, further comprising:

a hinge that is attached to each mirror plate such that the mirror plate can rotate relative to the substrate, wherein the hinge and the mirror plate are spaced apart from 0.5 to 1.5 micrometers.

166. The projector of claim 164, wherein the array of mirror plates comprises at least 1280 mirror plates along a length of the mirror plate array.

167. The projector of claim 164, wherein the array of mirror plates comprises at least 1400 mirror plates along a length of the mirror plate array.

168. The projector of claim 164, wherein the array of mirror plates comprises at least 1600 mirror plates along a length of the mirror plate array.

169. The projector of claim 164, wherein the array of mirror plates comprises at least 1920 mirror plates along a length of the mirror plate array.

170. The projector of claim 164, wherein the adjacent mirror plates has a center-to-center distance from 4.38 to 10.16 micrometers therebetween when the adjacent mirror plates are parallel to the substrate.

171. The projector of claim 164, wherein the gap between the adjacent mirror plates is from 0.25 to 0.5 micrometers therebetween when the adjacent mirror plates are parallel to the substrate.

172. The projector of claim 164, wherein the gap between the adjacent mirror plates is 0.5 micrometers or less therebetween when the adjacent mirror plates are parallel to the substrate.

173. The projector of claim 165, wherein a distance between the hinge and the mirror plate is from 0.5 to 0.8 micrometers.

174. The projector of claim 165, wherein the distance between the hinge and the mirror plate is from 0.8 to 1.25 micrometers.

175. The projector of claim 165, wherein the distance between the hinge and the mirror plate is from 1.25 to 1.5 micrometers.

176. The projector of claim 170, wherein a center-to-center distance of adjacent mirror plates is from 8.07 to 10.16 micrometers.

177. The projector of claim 170, wherein the center-to-center distance of adjacent mirror plates is from 6.23 to 9.34 micrometers.

178. The projector of claim 170, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 6.57 micrometers.

179. The projector of claim 170, wherein the center-to-center distance of adjacent mirror plates is from 4.38 to 9.34 micrometers.

180. The projector of claim 164, further comprising: a hinge attached to the mirror plate such that the mirror plate can rotate relative to the substrate along a rotation axis that is parallel to but offset from a diagonal of the mirror plate when viewed from the top of the mirror plate; and wherein the mirror plate can rotate to an angle at least 14 degrees relative to the substrate; and wherein the adjacent mirror plates has a center-to-center distance from 4.38 to 10.16 micrometers when the adjacent mirror plates are parallel to the substrate.

181. The projector of claim 164, further comprising:

an electrode proximate to each mirror plate for electrostatically dèflecting the mirror plate.

182. The projector of claim 164, wherein the substrate is glass or quartz that is visible light transmissive.

183. The projector of claim 182, wherein the substrate comprises an anti-reflection film on a surface of the substrate.

184. The projector of claim 182, wherein the substrate comprises a light absorption frame around an edge of the substrate.

185. The projector of claim 164, wherein each mirror plate has an area; and wherein a ratio of a summation of all areas of the mirror plates to an area of the substrate is 90 percent or more.

186 The projector of claim 164, wherein each mirror plate rotate relative to the substrate in response to an electrostatic field.

187 The projector of claim 164, further comprising:

a first electrode that drives the mirror plate rotate in a first rotation direction relative to the substrate; and

a second electrode that drives the mirror plate rotate in a second rotation direction opposite to the first rotation direction relative to the substrate.

188 The projector of claim 187, wherein the first electrode and the second electrode are on the same side relative to the rotation axis of the mirror plate.

189 The projector of claim 187, wherein the first electrode and the second electrode are on the opposite sides relative to the rotation axis of the mirror plate.

190 The projector of claim 164, wherein the substrate is semiconductor

191 The projector of claim 164, wherein the light source is an arc lamp having an effective arc length of 1.0 millimeter.

192 The projector of claim 164, wherein the light source is an arc lamp having an effective arc length less than 1.0 millimeter.

193 The projector of claim 164, wherein the light source is an arc lamp having an effective arc length around 0.7 millimeter.

194 The projector of claim 164, further comprising:

a video signal input that inputs a plurality of video signals, based on which the mirror plates of the projector selectively reflects light such that the reflected light from the mirror plates forms a plurality of videos on the display target.

195. The projector of claim 164, wherein the gap between the adjacent mirror plates is from 0.15 to 0.25 micrometers.